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MINERAL INFORMATION SERVICE is designed to inform the public on the geology and mineral resources of California and on the usefulness of minerals and rocks, and to serve as a news release on mineral discoveries, mining operations, markets, statistics, and new publications. It is issued monthly by the California State Division of Mines. Subscription price, January through December, is \$1.00.

COMMERCIAL SILICA

Quartz (SiO_2 or silica) is among the earth's abundant minerals, but in California, deposits of silica that are suitable for commercial purposes and also convenient to consuming centers are relatively scarce. Commercial silica includes silica sand, quartzite, quartz from veins and pegmatites, and quartz cobbles; these commodities are in part interchangeable in industry and may be conveniently considered together. Although commercial silica is a low-priced commodity, it must meet high specifications. For many uses silica containing 97 to 99 percent SiO_2 is required; and maximum limits for certain impurities such as Fe_2O_3 are seldom more than 0.06 percent.

In 1946, the last year for which figures are available, California produced about 600,000 tons of silica valued at nearly 1.5 million dollars. Roughly 85 percent of the total was silica sand, and most of the remainder was quartzite. Very little vein quartz and pegmatite quartz is produced. California lacks high quality silica sand, but low-grade material beneficiated by relatively complex processes supplies approximately half the state's requirements. Most of the remainder is obtained from southern Nevada and Ottawa, Illinois. Much of the quartzite used in California comes from large, but only partially explored, deposits in the southeastern part of the state; a comparatively small tonnage is obtained from southern Oregon. At present, California obtains vein and pegmatite quartz from out-of-state sources. Quartz veins and quartz-bearing pegmatites in the Peninsular Ranges and Sierra Nevada formerly were worked on a modest scale and are potential sources. Deposits of quartz cobbles in the northern Sierra foothills, although not fully utilized at present, are sources of potential importance.

Geologic Occurrence

Quartz is common in igneous, sedimentary, and metamorphic rocks, but only a few rock types are commercial sources of silica. The average igneous rock contains 12 percent quartz, but it is not eco-

nomic to crush a quartz-rich rock such as granite and separate the quartz grains from it.

Pegmatites and veins

Quartz is obtained from certain pegmatites and veins. Common or heterogeneous pegmatites are irregular, tabular to ovoid bodies composed of milky quartz and feldspar with minor amounts of biotite, muscovite, black tourmaline, and other minerals. Most pegmatites are found in granitic rocks, but they also occur in metamorphic rocks. They contain lenticular or spherical masses of quartz and feldspar large enough in many cases to mine separately or from which marketable products can be prepared by cobbing. Ordinarily both quartz and feldspar are mined from the same deposit. Zoned pegmatites, from which gems, beryl, and lithium-bearing, and tin-bearing minerals are obtained, usually have quartz cores or intermediate quartz zones, but ordinarily quartz is not recovered from them. Often the minerals sought do not occur in the quartz-rich parts of the pegmatite, and in addition the quartz is likely to be intergrown with unwanted minerals.

Barren veins consisting of little or nothing but massive, crystalline, milky quartz are important sources of silica, and the purest commercial silica available is obtained from them. They occur in both granitic and metamorphic rocks and, like the quartz-feldspar pegmatites, are tabular or ovoid in shape. Silica for most purposes cannot be obtained from mineralized quartz veins because of the presence of deleterious minerals, particularly pyrite. Quartz-rich tailings can, however, be rendered usable by beneficiation.

Sand, sandstone, and gravel

Under favorable circumstances the weathering of quartz-bearing rocks yields quartz-rich sands, sandstones, and gravels that are important sources of commercial silica. Where erosion is rapid and mechanical weathering processes predominate, the mineral grains of the parent rock are swept away as